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L2	2832652	window size	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	OR	ON	2006/02/15 15:47
L3	593187	delay	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	OR	ON	2006/02/15 15:47
L4	12066272	@ad<"20011201"	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	OR	ON	2006/02/15 15:47
L5	283	1 and (2 same 3) and 4 and "709"/\$.ccls.	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	OR	ON	2006/02/15 15:47
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S2	1	"20030193893"	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	OR	ON	2006/02/15 14:02
S3	1	"20020172153"	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	OR	ON	2006/02/15 14:02
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S5	2	"6934256"	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	OR	ON	2006/02/15 14:02
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S15	28	S14 S11 S10 S9 S8 S7 S6 S5 S4 S3 S2 S1	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	OR	ON	2006/02/15 15:46

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1 Attacking passwords and bringing down the network: Misbehaving TCP receivers can cause internet-wide congestion collapse

Rob Sherwood, Bobby Bhattacharjee, Ryan Braud

November 2005 **Proceedings of the 12th ACM conference on Computer and communications security CCS '05**

Publisher: ACM Press

Full text available: pdf(258.05 KB) Additional Information: full citation, abstract, references, index terms

An *optimistic* acknowledgment (opt-ack) is an acknowledgment sent by a misbehaving client for a data segment that it has not received. Whereas previous work has focused on opt-ack as a means to greedily improve end-to-end performance, we study opt-ack exclusively as a denial of service attack. Specifically, an attacker sends optimistic acknowledgments to many victims in parallel, thereby amplifying its effective bandwidth by a factor of 30 million (worst case). Thus, even a relatively mode ...

**Keywords:** congestion control, distributed denial of service

2 Paper session DB-3 (databases): sensors and data streams: Adaptive load shedding for windowed stream joins

Büğra Gedik, Kun-Lung Wu, Philip S. Yu, Ling Liu

October 2005 **Proceedings of the 14th ACM international conference on Information and knowledge management CIKM '05**

Publisher: ACM Press

Full text available: pdf(431.88 KB) Additional Information: full citation, abstract, references, index terms

We present an adaptive load shedding approach for windowed stream joins. In contrast to the conventional approach of dropping tuples from the input streams, we explore the concept of *selective processing* for load shedding. We allow stream tuples to be stored in the windows and shed excessive CPU load by performing the join operations, not on the entire set of tuples within the windows, but on a dynamically changing subset of tuples that are learned to be highly beneficial. We support such ...

**Keywords:** load shedding, stream joins

3 Wireless: Idle sense: an optimal access method for high throughput and fairness in rate diverse wireless LANs

Martin Heusse, Franck Rousseau, Romaric Guillier, Andrzej Duda

August 2005 **Proceedings of the 2005 conference on Applications, technologies, architectures, and protocols for computer communications SIGCOMM '05**

Publisher: ACM Press

Full text available:  pdf(292.29 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

We consider wireless LANs such as IEEE 802.11 operating in the unlicensed radio spectrum. While their nominal bit rates have increased considerably, the MAC layer remains practically unchanged despite much research effort spent on improving its performance. We observe that most proposals for tuning the access method focus on a single aspect and disregard others. Our objective is to define an access method optimized for throughput and fairness, able to dynamically adapt to physical channel condit ...

**Keywords:** 802.11, access methods, fairness, wireless LANs

**4 Link and channel measurement: A simple mechanism for capturing and replaying wireless channels**



Glenn Judd, Peter Steenkiste

August 2005 **Proceeding of the 2005 ACM SIGCOMM workshop on Experimental approaches to wireless network design and analysis E-WIND '05**

Publisher: ACM Press

Full text available:  pdf(6.06 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Physical layer wireless network emulation has the potential to be a powerful experimental tool. An important challenge in physical emulation, and traditional simulation, is to accurately model the wireless channel. In this paper we examine the possibility of using on-card signal strength measurements to capture wireless channel traces. A key advantage of this approach is the simplicity and ubiquity with which these measurements can be obtained since virtually all wireless devices provide the req ...

**Keywords:** channel capture, emulation, wireless

**5 Practical routing in delay-tolerant networks**



Evan P. C. Jones, Lily Li, Paul A. S. Ward

August 2005 **Proceeding of the 2005 ACM SIGCOMM workshop on Delay-tolerant networking WDTN '05**

Publisher: ACM Press

Full text available:  pdf(213.05 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Delay-tolerant networks (DTNs) have the potential to connect devices and areas of the world that are under-served by current networks. A critical challenge for DTNs is determining routes through the network without ever having an end-to-end connection, or even knowing which "routers" will be connected at any given time. Prior approaches have focused either on epidemic message replication or on knowledge of the connectivity schedule. The epidemic approach of replicating messages to all nodes is e ...

**Keywords:** delay tolerant network, route metrics, routing

**6 Transport: One more bit is enough**



Yong Xia, Lakshminarayanan Subramanian, Ion Stoica, Shivkumar Kalyanaraman

August 2005 **Proceedings of the 2005 conference on Applications, technologies, architectures, and protocols for computer communications SIGCOMM '05**

Publisher: ACM Press

Full text available:  pdf(1.19 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Achieving efficient and fair bandwidth allocation while minimizing packet loss in high bandwidth-delay product networks has long been a daunting challenge. Existing end-to-end congestion control (eg TCP) and traditional congestion notification schemes (eg TCP+AQM/ECN) have significant limitations in achieving this goal. While the recently proposed XCP protocol addresses this challenge, XCP requires multiple bits to encode the congestion-related information exchanged between routers ...

**Keywords:** AQM, ECN, TCP, XCP, congestion control, protocol

**7 "De-randomizing" congestion losses to improve TCP performance over wired-wireless networks**



Saâd Biaz, Nitin H. Vaidya

June 2005 **IEEE/ACM Transactions on Networking (TON)**, Volume 13 Issue 3

**Publisher:** ACM Press

Full text available: [pdf\(593.30 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Currently, a TCP sender considers all losses as congestion signals and reacts to them by throttling its sending rate. With Internet becoming more heterogeneous with more and more wireless error-prone links, a TCP connection may unduly throttle its sending rate and experience poor performance over paths experiencing random losses unrelated to congestion. The problem of distinguishing congestion losses from random losses is particularly hard when congestion is light: congestion losses themselves a ...

**Keywords:** communication systems, distributed decision-making, losses, networks, packet switching

**8 Transport 2: TCP with adaptive pacing for multihop wireless networks**



Sherif M. ElRakabawy, Alexander Klemm, Christoph Lindemann

May 2005 **Proceedings of the 6th ACM international symposium on Mobile ad hoc networking and computing MobiHoc '05**

**Publisher:** ACM Press

Full text available: [pdf\(508.33 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

In this paper, we introduce a novel congestion control algorithm for TCP over multihop IEEE 802.11 wireless networks implementing rate-based scheduling of transmissions within the TCP congestion window. We show how a TCP sender can adapt its transmission rate close to the optimum using an estimate of the current 4-hop propagation delay and the coefficient of variation of recently measured round-trip times. The novel TCP variant is denoted as TCP with Adaptive Pacing (TCP-AP). Opposed to previous ...

**Keywords:** IEEE 802.11 wireless networks, analysis and design of transport protocols, end-to-end congestion control, performance evaluation

**9 Workshop on Dynamic Analysis (WODA): Dynamic detection and visualization of software phases**



Steven P. Reiss

May 2005 **ACM SIGSOFT Software Engineering Notes , Proceedings of the third international workshop on Dynamic analysis WODA '05**, Volume 30 Issue 4

**Publisher:** ACM Press

Full text available: [pdf\(216.19 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Software executes in phases. JIVE is a software visualization tool that provides a high-level view of what is occurring in a Java system as it happens, offering information about both what classes are executing, what classes are being allocated, synchronizations, and what are the threads and what state each thread is in. This paper describes how we used the information available to JIVE to detect and then display the current phase of execution.

**Keywords:** Program monitoring, software phases, software visualization

**10 A stochastic model of TCP/IP with stationary random losses**



Eitan Altman, Konstantin Avrachenkov, Chadi Barakat

April 2005 **IEEE/ACM Transactions on Networking (TON)**, Volume 13 Issue 2

**Publisher:** ACM Press

Full text available:  pdf(870.08 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

In this paper, we present a model for TCP/IP congestion control mechanism. The rate at which data is transmitted increases linearly in time until a packet loss is detected. At this point, the transmission rate is divided by a constant factor. Losses are generated by some exogenous random process which is assumed to be stationary ergodic. This allows us to account for any correlation and any distribution of inter-loss times. We obtain an explicit expression for the throughput of a TCP connection ...

**Keywords:** Markov arrival process, TCP/IP, ergodic losses, fluid model, stationary

**11 CYRF: a theory of window-based unicast congestion control** 

 Nishanth R. Sastry, Simon S. Lam

April 2005 **IEEE/ACM Transactions on Networking (TON)**, Volume 13 Issue 2

**Publisher:** ACM Press

Full text available:  pdf(624.98 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This work presents a comprehensive theoretical framework for memoryless window-based congestion control protocols that are designed to converge to fairness and efficiency. We first derive a necessary and sufficient condition for stepwise convergence to fairness. Using this, we show how fair window increase/decrease policies can be constructed from suitable pairs of monotonically nondecreasing functions. We generalize this to smooth protocols that converge over each congestion epoch. The framework ...

**Keywords:** TCP-friendliness, congestion control, fairness, transport protocols

**12 Accumulation-based congestion control** 

Yong Xia, David Harrison, Shivkumar Kalyanaraman, Kishore Ramachandran, Arvind Venkatesan

February 2005 **IEEE/ACM Transactions on Networking (TON)**, Volume 13 Issue 1

**Publisher:** IEEE Press

Full text available:  pdf(870.66 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This paper generalizes the TCP Vegas congestion avoidance mechanism and uses accumulation, buffered packets of a flow inside network routers, as a congestion measure based on which a family of congestion control schemes can be derived. We call this model Accumulation-based Congestion Control (ACC), which fits into the nonlinear optimization framework proposed by Kelly. The ACC model serves as a reference for packet-switching network implementations. We show that TCP Vegas is one possible scheme ...

**Keywords:** TCP, accumulation, congestion control

**13 Performance of TCP congestion control with explicit rate feedback** 

Aditya Karnik, Anurag Kumar

February 2005 **IEEE/ACM Transactions on Networking (TON)**, Volume 13 Issue 1

**Publisher:** IEEE Press

Full text available:  pdf(656.34 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

We consider a modification of TCP congestion control in which the congestion window is adapted to explicit bottleneck rate feedback; we call this RATCP (Rate Adaptive TCP). Our goal in this paper is to study and compare the performance of RATCP and TCP in various network scenarios with a view to understanding the possibilities and limits of providing better feedback to TCP than just implicit feedback via packet loss. To understand the dynamics of rate feedback and window control, we develop and ...

**Keywords:** TCP, congestion control, rate feedback

14 Measurement tools: Robust synchronization of software clocks across the internet

Darryl Veitch, Satish Babu, Attila Pásztor

October 2004 **Proceedings of the 4th ACM SIGCOMM conference on Internet measurement****Publisher:** ACM PressFull text available: [pdf\(1.59 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Accurate, reliable timestamping which is also convenient and inexpensive is needed in many important areas including real-time network applications and network measurement. Recently the TSC register, which counts CPU cycles in popular PC architectures, was proposed as the basis of a new software clock which in terms of rate performance performs as well as more expensive GPS alternatives. Smooth and precise clock rate is essential to measure time *<math>i> differences</math>* accurately. We show ...

**Keywords:** GPS, NTP, network measurement, round-trip time, software clock, synchronization, timing

15 Performance analysis for a new medium access control protocol in wireless LANs

Younggoo Kwon, Yuguang Fang, Haniph Latchman

September 2004 **Wireless Networks**, Volume 10 Issue 5**Publisher:** Kluwer Academic PublishersFull text available: [pdf\(301.06 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

One fundamental issue in high-speed wireless local area networks (LANs) is to develop efficient medium access control (MAC) protocols. In this paper, we focus on the performance improvement in both MAC layer and transport layer by using a novel medium access control protocol for high-speed wireless LANs deploying carrier sense multiple access/collision avoidance (CSMA/CA). We first present a recently proposed distributed contention-based MAC protocol utilizing a Fast Collision Resolution (FCR) ...

**Keywords:** IEEE 802.11, TCP, UDP, medium access control (MAC), wireless LANs (WLANS)

16 Sizing router buffers

Guido Appenzeller, Isaac Keslassy, Nick McKeown

August 2004 **ACM SIGCOMM Computer Communication Review , Proceedings of the 2004 conference on Applications, technologies, architectures, and protocols for computer communications SIGCOMM '04**, Volume 34 Issue 4**Publisher:** ACM PressFull text available: [pdf\(294.61 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

All Internet routers contain buffers to hold packets during times of congestion. Today, the size of the buffers is determined by the dynamics of TCP's congestion control algorithm. In particular, the goal is to make sure that when a link is congested, it is busy 100% of the time; which is equivalent to making sure its buffer never goes empty. A widely used rule-of-thumb states that each link needs a buffer of size  $B = \overline{RTT} \times C$ , where  $\overline{RTT}$  is the average ...

**Keywords:** TCP, bandwidth delay product, buffer size, internet router

17 Energy efficient architectural techniques: Energy-aware demand paging on NANDflash-based embedded storages

Chanik Park, Jeong-Uk Kang, Seon-Yeong Park, Jin-Soo Kim

August 2004 **Proceedings of the 2004 international symposium on Low power electronics and design**

**Publisher:** ACM PressFull text available:  pdf(222.66 KB)Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

The ever-increasing requirement for high-performance and huge-capacity memories of emerging embedded applications has led to the widespread adoption of SDRAM and NAND flash memory as main and secondary memories, respectively. In particular, the use of energy consuming memory, SDRAM, has become burdensome in battery-powered embedded systems. Intuitively, though demand paging can be used to mitigate the increasing requirement of main memory size, its applicability should be deliberately elaborated ...

**Keywords:** NAND flash memory, demand paging, embedded storages, embedded systems, page replacement, virtual memory

18 [Independent zone routing: an adaptive hybrid routing framework for ad hoc wireless networks](#) 

Prince Samar, Marc R. Pearlman, Zygmunt J. Haas

August 2004 **IEEE/ACM Transactions on Networking (TON)**, Volume 12 Issue 4**Publisher:** IEEE PressFull text available:  pdf(676.93 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

To effectively support communication in such a dynamic networking environment as the ad hoc networks, the routing framework has to be adaptable to the spatial and temporal changes in the characteristics of the network, such as traffic and mobility patterns.

Multiscoping, as is provided through the concept of the Zone Routing Protocol (ZRP) for example, can serve as a basis for such an adaptive behavior. The Zone Routing framework implements hybrid routing by every network node proactively maintains ...

**Keywords:** ad hoc network, adaptive routing, broadcast, hybrid routing, independent zone routing, multiscoping routing, proactive routing, reactive routing, routing framework, routing zone, send zone, zone routing protocol

19 [A method for estimating the proportion of nonresponsive traffic at a router](#) 

Zhili Zhao, Swaroop Darbha, A. L. Narasimha Reddy

August 2004 **IEEE/ACM Transactions on Networking (TON)**, Volume 12 Issue 4**Publisher:** IEEE PressFull text available:  pdf(701.85 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

In this paper, a scheme for estimating the proportion of the incoming traffic that is not responsive to congestion at a router is presented. The idea of the proposed scheme is that if the observed queue length and packet drop probability do not match the predictions from a model of responsive (TCP) traffic, then the error must come from nonresponsive traffic; it can then be used for estimating the proportion of nonresponsive traffic. The proposed scheme is based on the queue length history, pack ...

**Keywords:** control theory, estimation, nonresponsive traffic, traffic modeling

20 [Resynchronization and controllability of bursty service requests](#) 

Hani Jamjoom, Padmanabhan Pillai, Kang G. Shin

August 2004 **IEEE/ACM Transactions on Networking (TON)**, Volume 12 Issue 4**Publisher:** IEEE PressFull text available:  pdf(980.39 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

There is an increasing prevalence of interactive Web sessions in the Internet. These are mostly short-lived TCP connections that are delay-sensitive and have transfer times dominated by TCP backoffs, if any, during connection establishment. Unfortunately, arrivals of such connections at a server tend to be bursty, and can trigger multiple

retransmissions, resulting in long average client-perceived delays. Traditional traffic control mechanisms, such as token bucket filters, are designed to compl ...

**Keywords:** TCP performance, traffic characterization, traffic control

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